ELEC-E4720 Advanced Circuit Theory Final Exam 26.5.2016

1.

a) What is the definition of a PR function? (2p)

b) Sketch the frequency response of a bandpass filter designed based on a third-order Chebyshev prototype filter. (3p)

c) Is the condition $|S_{21}|^2 = 1 - |S_{11}|^2$ valid for the scattering parameters of an RC circuit? Give reasons with a few words. (2p)

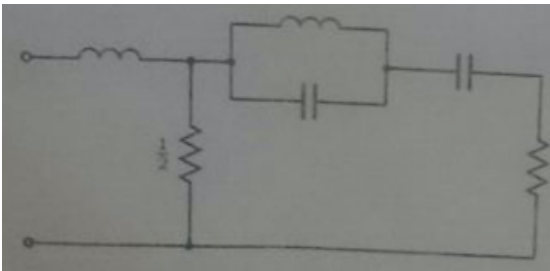d) Why do we use Richards' transform? What does it do? (3p)

2.

Realise the transfer function

$$Z_{21}(s) = \frac{Ks^2}{s^3 + 3s^2 + 3s + 1}$$

when the circuit is terminated with a 1 Ω resistance.

3.

Realise the driving-point function

$$Z(s) = \frac{2s^4 + 8s^3 + 13s^2 + 6s + 3}{4s^3 + 14s^2 + 12s + 6}$$

using the circuit topology shown in the figure. The value of one resistance is given.